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STUDIES ON MOSQUITOES FROM THE PHILIPPINE ISLANDS AND AUSTRALASIA (Diptera: Culicidae)

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A large amount of mosquito material from the islands of the Pacific has become available for study as a result of recent extensive collecting by Army and Navy personnel. In the identification of these specimens several new species have been discovered, as well as a need for a revision in our concept of some others previously described. This paper is presented to make the names of 8 new species and 2 new subgenera available for those engaged in mosquito work in the Pacific area, and to point out characters that will separate species which have been confused in the past. We are particularly indebted to entomologists of the Army and Navy for submitting this material for study. Holotypes of all the new species are deposited in the U. S. National Museum.

Figures 1 to 10 were drawn by R. M. Bohart, figures 11 to 14 by Arthur D. Cushman.

THE AEDES (FINLAYA) KOCHI GROUP

Mosquitoes of the *kochi* group are characterized by having spotted wings with broad wing scales, many-banded femora, banded or spotted tibiae and tarsi, spotted or variegated abdomen, indefinite yellowish or whitish scutal pattern, both broad, appressed, and narrow, curved scales on the vertex and on the scutellum, and outstanding scales apically on some of the abdominal sternites. Superficially the group separates into two color types: Black and whitish species such as *kochi*, *poicilia*, *knighti*, and *samoanus;* and black and yellow species such as *flavipennis*, *avistyla*, *aranetanus*, *wallacei*, and *solomonis*. A study of male genitalia, however, indicates that *solomonis* is much more closely related to *kochi* than to *aranetanus* or *flavipennis*.

Brug (1934) points out differences among *kochi*, *samoanus*, *poicilia*, and *aranetanus* in the claspette (harpago) of the male. In order properly to appreciate such differences the claspette should be removed from the genitalia and mounted separately

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in order to obtain a profile view. The apical bladelike portion of the claspette is slender and sharply pointed in *aranetanus*, *flavipennis*, *avistyla*, and particularly in *poicilia*. It is sharply pointed but broadly triangular in *samoanus*, whereas in *knighti*, *kochi*, and *solomonis* it is rather broad with the apex blunt.

It appears likely that all species of the group breed in water collected in plants. All known larvae have characteristic stellate hairs on the thorax and abdomen.

Key to Adults of the Kochi Group

1. Femora without prominent, apical, ventral tufts of long outstanding scales; tarsi mostly yellow, spotted with black. 2
   Femora with prominent, apical, ventral tufts of long outstanding scales. . 3
2. Abdominal tergites 2 to 4 with lateral margins almost entirely yellow, particularly in the male, or with yellow in longitudinal streaks (Philippines). . . . . *aranetanus* (Banks)[1]
   Abdominal tergites 2 to 4 with lateral margins dark or variegated, yellow markings appearing as spots or transverse, irregular marks, not as longitudinal streaks (Philippines). . . . . *flavipennis* (Gile).
3. First hind tarsal segment white and yellow, spotted with black, or at least with more than 3 pale rings; second and third with black reduced. 4
   First hind tarsal segment with 3 whitish rings; second and third with broad basal dark bands. 5
4. Fourth hind tarsal segment black and yellow, second and third yellow with narrow rings of white and black; apical three-fifths of proboscis in female largely or wholly yellow (Solomons). . . *solomonis*, new species.
   Fourth hind tarsal segment all black, second and third white with narrow rings of yellow and black; proboscis of female with a median yellow ring (New Ireland). . . . . *wallacei* Edwards.
5. Pale bands of second and third hind tarsal segments about one-fourth the length of the segments (New Georgia). . . . . *knighti*, new species.
   Pale bands of second and third hind tarsal segments one-third to one-half the length of the segments. 6
6. Wing with 4 to 5 white spots on apical half of costa; female palpus with apical third above snowy white (India and Malaysia). . . . . *poicilia* (Theobald).
   Wing with not more than 3 pale spots on apical half of costa; female palpus with less than apical fourth pale. 7
7. Dark costal spot just beyond middle of wing usually at least twice as long as the following pale spot (New Guinea, New Britain, New Ireland, Solomons, Queensland). . . . . *kochi* (Doenitz).
   Dark costal spot just beyond middle of wing usually less than twice as long as the following pale spot (Samoa). . . . . *samoanus* (Gruenberg).

[1] We have not seen specimens of *avistyla* Brug (1939), but judging from Brug's discussion and figures it would probably run to *aranetanus*, from which it can be separated by male genitalia.

KEY TO THE KOCHI GROUP BASED ON MALE GENITALIA

1. Dististyle with a strong subapical prong on the inner side..... 2
   Dististyle without a prong on inner side..... 3
2. Basistyle with a subapical, ventral scale tuft in addition to the inner scale tuft.....*aranetanus* (Banks).
   Basistyle only with an inner scale tuft.....*avistyla* Brug.
3. Basistyle without a specialized seta arising on the inner surface between the claspette and the scale tuft..... 4
   Basistyle with a specialized seta arising on the inner surface between the claspette and the scale tuft..... 6
4. Dististyle strongly bent at apical third; basistyle ventrally with 3 very strong bristles toward base and a clump of 5 to 6 strong bristles near apex.....*flavipennis* (Giles).
   Dististyle somewhat curved but not strongly bent; basistyle without strong bristles arranged as above..... 5
5. Longest scales of scale tuft less than half the length of the basistyle.....
   poicilia (Theobald).
   Longest scales of scale tuft about half the length of the basistyle.....
   knighti, new species.
6. Specialized seta with basal half about as broad as apical half; a row of strong lateroventral bristles running from base to apex of basistyle....
   samoanus (Gruenberg).
   Specialized seta with basal half very slender, apical half flattened and enlarged..... 7
7. Basoventral patch of bristles on basistyle only slightly concentrated basally.....*kochi* (Doenitz).
   Basoventral patch of bristles on basistyle extending as far apically as scale tuft, but concentrated basally into a well-defined circular clump..
   solomonis, new species.

Aedes (Finlaya) aranetanus (Banks)

(Fig. 3)

Finlaya aranetana Banks, 1906: 1001.

Aedes flavipennis (Giles), Edwards, 1922b: 465 (in part); 1926: 105; 1932: 149; Brug, 1934: 513; 1939: 107.

Following Edwards (1922b) this species has been treated as a synonym of *flavipennis* (Giles) and was discussed and figured under that name by Brug (1934, 1939). It differs markedly in the male genitalia as shown in figures 3 and 4. The species is known only from the Philippines, where Banks (1906) recorded it as breeding in the axils of banana leaves.

Material studied: 1 ♀ and 2 ♂♂ cotypes, Negros Occidental; 1 pair, Fort McKinley, Rizal, Luzon; 1 ♀, Camp Stotsenberg, Pampanga, Luzon.

Aedes (Finlaya) avistyla Brug

(Fig. 5)

Aedes flavipennis avistyla Brug, 1939: 107.

According to Brug (1939) this species is hardly separable from *aranetanus* (given by Brug as *flavipennis*) except in the male genitalia, which have only a single scale tuft in *avistyla*. The type series from Celebes and Boeton was collected as larvae in leaf axils of taro and in a bamboo stump. As figured by Brug, the postclypeal hair (d) of the larva has 3 to 4 branches, the lower head hair (B) has 2 branches; the siphon is bare with an index of about 2.4, and with 7 to 10 pecten teeth.

Aedes (Finlaya) flavipennis (Giles)

(Fig. 4)

Finlaya flavipennis Giles, 1904: 366.

Popea lutea Ludlow, 1905: 96.

Aedes flavipennis (Giles), Edwards, 1922b: 465 (in part); 1926: 105; 1932: 149.

The species is known only from the Philippine Islands. According to Ludlow (1905) the holotype male of *lutea* from Camp Stotsenberg was collected near banana trees.

Material studied: A long series of specimens labeled "*Popea lutea* Ludlow, P. I."; a series of specimens labeled "P. I."; and 1 ♀ from the island of Samar.

Aedes (Finlaya) solomonis, new species

(Fig. 9)

Aedes flavipennis (Giles), Knight, Bohart, and Bohart, 1944: 68.

Male.—Length 3–4 mm., wing 2.4–2.6 mm. Median area of vertex with broad, appressed, dark, and some pale, scales, mixed with narrow, curved, whitish and upright, forked, dark scales, a few pale, upright scales anteriorly; sides of vertex with broad, appressed, white scales and a spot of dark ones. Torus dark brown with a patch of small, broad, yellow scales on inner side. Proboscis about one-fourth longer than fore femur, rather stout, median dorsal line mostly yellow, undersurface and sides of basal half clothed with somewhat outstanding black scales, apical two-fifths with a mixture of yellow and dark scales. Palpus slightly longer than proboscis, slightly swollen apically, banded and spotted with yellow and white scales, penultimate segment mostly white and yellow, apical segment dark in middle. Scutum with mixed narrow, curved brown and whitish scales, the latter in indefinite patches; pronotum with broad appressed white scales, posterior pronotum with a few yellow, and sometimes with a few black, broad scales; scutellum with black, yellow and white, broad, appressed scales and a few narrow, curved, pale ones. Pleuron with 2 or 3 postspiracular and no lower mesepimeral bristles; dark brown with many white, broad scales in an irregular band and a patch beneath it. Wing elaborately spotted with yellow, white, and dark brown, broad scales, 4 large, irregular, pale spots along front margin, 2 of which are beyond middle of wing; fork of vein 2

slightly basad of that of vein 4. Halter all yellow or with a few dark scales on knob. Legs: Coxae black with some pale scales; femora whitish to yellow, and with many spots and bands of dark scales, apices with prominent tufts of long, outstanding, yellow and black scales; tibiae and tarsi mostly yellow, spotted with black; first hind tarsal with apical, basal, and medial white bands, second and third hind tarsals whitish apically and narrowly dark basally, fourth hind tarsal yellow with a variable amount of black, fifth all yellow; outer claw of fore and mid tarsi with a strong tooth, hind tarsal claw simple. Abdomen mostly yellow dorsally, with median indistinct dark spots and some scattered dark scales; venter mostly dark scaled with some yellow and white scales and many long golden hairs, outstanding dark scales at apices of sternites V to VII. Genitalia (fig. 9): Basistyle about 3 times as long as width at base, with a long membranous inner surface bearing a long tuft of scales and a hair patch medially, many curved hairs and a specialized seta basally; claspette long, slender, flattened toward apex, which is narrowly rounded; basistyle with a basoventral patch of bristles extending as far apically as scale tuft but concentrated basally into a well-defined circular patch, about 7 moderately long, lateral bristles, stronger apically, many other smaller bristles and lateral scales; dististyle slender, slightly curved, apical spine about three-fifths as long as dististyle; lobes of ninth tergite with 1 or 2 bristles; mesosome simple.

Female.—Differs from male chiefly as follows: All upright scales of vertex dark, proboscis slightly shorter than fore femur, apical two-thirds yellow, basal third dark; palpus about one-fourth as long as proboscis, white-tipped and with a few other pale scales. Mid and hind tarsal claws simple. Abdomen mostly dark above, tergites II to V usually with 3 yellowish median spots.

Larva.—Very similar to *Aedes samoanus* (Gruenberg) but differing chiefly as follows: Postclypeal hair (d) with 4 to 6 branches, lower head hair (B) with 3 to 4 branches; gills somewhat longer and more slender; siphon with an index of about 2.5, very finely pilose, and with 10 or more pecten teeth.

Holotype.— ♂, Guadalcanal, Solomon Islands, March 1, 1944, reared from larvae taken from palm tree (Lechner collector). Paratypes: 9 ♂♂ and 13 ♀♀, same data as holotype; 3 ♂♂ and 7 ♀♀, Bougainville, Solomon Islands, April 7, 1944 (C. R. Bruck); 1 ♂, Bougainville, March 6, 1944, reared from larvae collected in "axils of plants in swamp" (A. B. Gurney); 3 ♂♂, 1 ♀, Bougainville, April 24 and May 12, 1944, reared from larva taken from "Arum-like plant in swamp" (A. B. Gurney); 1 ♀, Bougainville, April 27, 1944, reared from larvae from *Pandanus* trees (A. B. Gurney). Type material deposited in U. S. National Museum (Cat. No. 56977), British Museum, and University of Sydney.

This species is remarkably similar in coloration to *aranetanus*, but the shaggy apices of the femora and the male genitalia clearly indicate a close relationship to *kochi*. The latter is superficially very different, however.

Aedes (Finlaya) wallacei Edwards

Aedes wallacei Edwards, 1926: 105; Taylor, 1934: 234; Knight, Bohart, and Bohart, 1944: 34.

This species is known only from New Ireland. It was recorded by Taylor (1934) as breeding "exclusively in the axils of the leaves of the various species of *Pandanus*." Taylor further stated that the species entered houses to bite during the night.

Aedes (Finlaya) knighti, new species

(Fig. 7)

Male.—Length 3.5 mm., wing 2.2 mm. Vertex clothed with 5 spots of white, and 4 spots of dark, broad, appressed scales, median area with a sprinkling of dark, upright, forked, and pale, narrow, curved scales. Torus brown with a patch of small, broad, yellow scales on inner side; proboscis about one-fourth longer than fore femur, basal half mostly dark, yellowish median ring fairly broad, apical third mostly dark above and with at least a broken line of pale scales ventrally. Palpus slightly longer than proboscis, basal half with 3 broad, pale bands, penultimate segment mostly dark, last segment with middle third dark. Scutum with mixed brown and pale yellow, narrow, curved scales, the latter in indefinite patches; pronotum with broad, appressed, yellowish scales on both lobes; scutellum with narrow and broad, yellowish scales, a patch of broad, dark scales on median lobe. Pleuron with about 5 postspiracular bristles and no lower mesepimeral bristles; an irregular band of broad, whitish scales and a patch beneath it. Wings spotted with groups of broad, pale, and dark scales, 4 large pale spots along front margin, 2 of which are beyond middle of wing; fork of vein 2 somewhat basad of that of vein 4. Halter all pale. Legs: Coxae brown with small patches of pale scales; femora with many black and whitish bands, apices with moderate tufts of long, outstanding, yellow and black scales; tibiae with 6 to 8 black and a similar number of whitish bands; first hind tarsal with 3 narrow white bands, second and third with apical white bands which are hardly one-fourth as long as their segments, fourth hind tarsal all black, fifth all white; outer claw of fore and mid tarsi with a strong tooth, hind tarsal claw simple. Abdomen yellow above, variegated with dark scales, apically mostly yellow; venter mostly dark scaled with some yellowish scales and many long golden hairs; outstanding dark scales at apices of sternites VI and VII. Genitalia (fig. 7): Basistyle about 3.5 times as long as broad at base, with a long membranous inner surface bearing a long tuft of scales and a hair patch medially, many curved hairs but no large specialized seta basally; claspette long, slender, flattened toward apex and blunt; basistyle with about 7 moderately long lateral bristles in addition to many smaller bristles and lateral scales; dististyle slender, slightly inflated medially, less than half as long as basistyle, apical spine at least three-fourths as long as dististyle; lobes of ninth tergite with a single bristle; mesosome simple.

Holotype.— ♂, and 2 ♂♂ paratypes, Rendova Is., New Georgia Group, Solomon Islands, August 1943 (K. L. Knight). Types in the U. S. National Museum (Cat. No. 56978).

The restricted white bands on the second and third hind tarsal segments distinguish *knighti* from the 3 similarly marked species of the group, *kochi*, *samoanus*, and *poicilia*. The male genitalia are similar to those of *poicilia* in lacking the specialized seta of the basistyle and in having a short dististyle with a long apical spine. However, *knighti* differs from *poicilia* in having a longer scale tuft and a stouter basistyle.

Aedes (Finlaya) poicilia (Theobald)

(Fig. 6)

Finlaya poicilia Theobald, 1903: 283; 1907: 520 (in part); 1910: 464 (in part).
Finlaya poicilipes Theobald, 1903: xvii, plate 13 (lapsus).
Finlaya poialia (Theobald), Giles, 1904: 366 (emendation?).
Aedes poicilia (Theobald), Edwards, 1922a: 260; 1922b: 465; 1924: 380; 1932: 149.
Aedes kochi poicilia Edwards, 1926: 104; Brug, 1931: 23; 1934: 513.
Aedes poecilius (Theobald), Barraud, 1934: 157 (emendation).

According to Barraud (1934), *poicilia* occurs in India, the Malay Peninsula and Archipelago, and the Philippines. The type locality is Penang, Straits Settlements. The larval habitat is recorded as the leaf axils of taro and *Crinum* in Java. The larva, described by Brug (1931), has a finely pilose siphon, 3-branched postclypeal hair (d), and 2-branched lower head hair (B).

Material studied: A long series of specimens from Mindanao, Luzon, and Samar. Some of the Luzon (Camp Stotsenberg) specimens were reared from a hole in a banana tree.

Aedes (Finlaya) kochi (Doenitz)

(Fig. 10)

Culex kochi Doenitz, 1901: 38.
Finlaya poicilia Theobald, 1907: 520 (in part).
Aedes kochi (Doenitz), Edwards, 1924: 380 (in part); 1926: 105; 1932: 149; Brug, 1934: 513; Knight, Bohart, and Bohart, 1944: 34.

There are specimens in the U. S. National Museum from New Guinea (type locality), New Britain (Rabaul), Solomon Islands (Bougainville, Treasury, Florida, Guadalcanal), and Queensland (Palm Island and Malanda). It has also been recorded from New Ireland, Tulagi, and Fiji. However, the specimens from Fiji may represent an undescribed species, according to the description of the larva and male genitalia given by Edwards (1935). A larva from Fiji in the U. S. National Museum resembles that of *samoanus* in having the siphon bare instead of finely pilose as in *kochi*.

Aedes kochi has been reported as frequently entering habitations and as breeding in axils of *Pandanus* and taro and in coconut shells.

The larva closely resembles that of *solomonis*. It differs in having the postclypeal hair (d) with 6 to 8 branches, the lower head hair (B) with 5 to 6 branches; the siphon somewhat more strongly pilose, with an index of about 4.0, and with no more than 8 pecten teeth.

Aedes (Finlaya) samoanus (Gruenberg)

(Fig. 8)

Finlaya samoana Gruenberg, 1913: 130.
Aedes kochi samoana (Gruenberg), Edwards, 1926: 105; 1928: 44; 1932: 149; Brug, 1931: 23; 1934: 513.
Aedes kochi (Doenitz), Buxton and Hopkins, 1925: 298.
Aedes samoana (Gruenberg), Edwards, 1935: 129.
Aedes samoanus (Gruenberg), Knight, Bohart, and Bohart, 1934: 34.

The adult of this species is very similar to that of *kochi*. The markings are somewhat variable and identification is best made on the basis of the small specialized seta of the male basistyle. It is probable that the species is restricted to Samoa, Tonga, and associated islands. All the specimens in the U. S. National Museum are from Samoa. The record of a female *samoanus* from Roviana, New Georgia, made by Paine and Edwards (1929) may refer to *knighti*.

According to Edwards (1928), *samoanus* is a persistent and irritating night biter. The larvae are found in the axils of *Colacasia*, *Alocasia*, and *Cyrtosperma*. The larva has been described by Buxton and Hopkins (1925). From an examination of a series of larvae in the U. S. National Museum, the species is characterized by having the postclypeal hair (d) with 2 to 4 branches and the lower head hair (B) with 2 branches; gills somewhat stouter than in *kochi;* siphon bare, with an index of about 2.4, and with 8 to 10 pecten teeth.

NEW SUBGENERA AND SPECIES OF AEDES

LUZONUS, new subgenus

Mottled species with very broad-scaled and spotted wings. Male antenna with hairs directed mainly dorsally and ventrally. Male palpus (broken) with first 2 segments as long as seven-eighths of proboscis. Proboscis about two-fifths longer than front femur in male, swollen on apical one-fourth in male, apical one-fifth in female. Vertex and scutellum with both broad and narrow scales. No lower mesepimeral bristles. Fore and mid tarsal claws of male with a basal tooth, hind tarsal claws simple. Eighth sternite of female not retracted; cerci very small. Male genitalia with simple, apically spined dististyle, tenth sternite lobe 3-toothed, mesosome simple, claspettes absent.

Subgenotype, *Aedes* (*Luzonus*) *clavirostris*, new species.

This subgenus resembles *Finlaya*, but the absence of claspettes and the apically swollen proboscis in both sexes are distinctive.

Aedes (Luzonus) clavirostris, new species

(Fig. 2)

Male.—Length about 3.5 mm., wing 3 mm. Median area of vertex with narrow, curved, creamy-colored and upright forked, brown to creamy scales, vertex laterally with a small patch of broad, appressed, black scales and a large patch of broad, appressed, whitish ones. Torus dark brown with many small, oval, yellow scales on inner and dorsal surfaces; proboscis about two-fifths longer than front femur, basal one-fifth dark with some outstanding scales beneath, following two-fifths slender and yellow, apical two-fifths swollen and with black and yellow scales mixed. Palpus broken beyond second segment, basal half and apex of second segment mostly dark, bristles inconspicuous except at apex of second segment. Scutum with narrow, curved, pale and dark scales arranged in indefinite patches; pronotum with small, broad, appressed scales, cream-colored on anterior pronotum, mostly dark on posterior pronotum. Scutellum with broad, appressed, dark and cream-colored scales, some narrow, curved, pale scales on lateral lobes. Pleuron with a few dark integumental spots below anterior spiracle, broad cream-colored scales in a small patch on postspiracular area, other cream-colored scales in 4 inconspicuous patches; apparently 2 postspiracular bristles. Wing speckled with very broad mostly heart-shaped black and yellow scales not arranged in definite spots, fork of vein 2 basad of that of vein 4. Halter yellow basally, brown-scaled on knob. Legs: Coxae partially dark scaled; femora in front mostly dark-scaled speckled with pale scales, mostly pale behind on mid and hind legs; tibiae yellow, speckled with brown, and with a dark apical spot; tarsi yellow, first segment speckled and with a subapical dark spot, second tarsal with 2 dark spots, third tarsal with a broad, dark, median spot, fourth and fifth tarsals with some dark median scales most numerous on hind legs. Abdomen with a median dorsal stripe of dark scales, sides of tergites and venter yellow with a speckling of dark scales, venter with many long golden hairs. Genitalia (fig. 2): Dististyle slender, tapering, with a short apical spine; basistyle with a pair of long, inner basal bristles, no claspettes; lobe of tenth sternite with 3 apical teeth; mesosome simple.

Female.—Differs from male chiefly as follows: Apical swelling of proboscis smaller and comprising only one-fifth of its length, proboscis about one-third longer than front femur; palpus about one-sixth as long as proboscis.

Holotype.— ♂, Camp Nichols, Rizal, Luzon, Philippine Islands, December 14, 1924 (G. McDonald). Paratype: 1 ♀, Camp Stotsenberg, Pampanga, Luzon, Philippine Islands, October 18, 1922. Type material in U. S. National Museum (Cat. No. 56979).

The superficial resemblance of *clavirostris* to *Aedes* (*Finlaya*) *flavipennis* (Giles) and *A.* (*Finlaya*) *aranetanus* (Banks) is remarkable. Among other points the unbanded femora, swollen proboscis, and broader wing scales of *clavirostris* readily distinguish it, however.

LEVUA, new subgenus

Dark species, without ornamentation. Scales on vertex narrow and curved medially, broad and appressed laterally. Proboscis somewhat longer than fore femur, not swollen. Palpus of female scarcely longer than clypeus, of male about one-fifth length of proboscis. Male antenna not strongly plumose. Scutellum probably with narrow scales only. No lower mesepimeral bristles. Claws of female all simple; inner fore claw of male toothed. First hind tarsal segment shorter than hind tibia. Cerci of female long. Male genitalia: Basistyle with basal lobe but no apical lobe; dististyle rather short, with stout subapical spine; claspette present, with slender terminal filament; mesosome simple; ninth tergite with prominent lobes.

Subgenotype, *Aedes* (*Levua*) *suvae*,[1] new species.

This subgenus most closely resembles *Geoskusea*, but the presence of claspettes and the very differently shaped dististyle and its terminal spine readily separate it. The female differs from *Geoskusea* in having the median scales of the vertex narrow.

Aedes (Levua) suvae, new species
(Fig. 11)

Male.—Length about 3 mm., of wing 2.35 mm. Head dark brown; vertex medially with narrow, curved, brown scales, laterally with broad, appressed, dark scales; many erect, forked, dark scales. Torus orange brown, with a few narrow, dark scales; flagellum orange brown, the verticils composed of 10–12 evenly spaced hairs. Palpus dark, straight, slightly widened apically. Proboscis slightly longer than fore femur. Scutum rather dark orange brown, the scales slender, curved, brown, the setae abundant, nearly black. Pronotum without scales; scutellum slightly paler, with very few scales (probably denuded); postnotum bare, yellow brown; pleuron orange brown, paler along the sutures, without scales except for a few broad, appressed, purplish-brown ones on sternopleuron. Wing with scales entirely dark, those on costa, subcosta, and vein 1 somewhat broadened, the rest narrow. Halter with stem yellow, the knob darker, with dark, rather broad scales. Legs dark brown, the coxae yellowish. Abdomen dark brown. Genitalia (Fig. 11): Basistyle rather stout, with stout setae on ventral margin near middle and 3 or 4 very stout setae on inner margin near apex; a round, flattened, setose, basal lobe; a short claspette, with densely setose stem and short attenuated filament; dististyle rather stout, curved, with a stout, short, curved, black subapical spine; mesosome oval, setose, with a median fold; tenth sternite with rounded, heavily sclerotized apex; ninth tergite somewhat triangular, with short setae from tubercules on the inner surface.

Female.—Length 4 mm., length of wing 3 mm. As in male except as follows: Palpus about length of clypeus, the last segment flattened and turned inward;

[1] Since the manuscript of this paper went to the printer, we have received a copy of the "Mosquito Control Training Manual," by David W. Amos, printed by the Fiji Times & Herald, Suva, 1944. In this publication, what appears to be this species is given under the name of *Aedes geoskusea*. This inadvertent use of a subgeneric name as a specific name apparently validates it as a specific name, and hence *geoskusea* replaces *suvae*.

verticils of flagellum with 5–6 setae; postnotum darker; eighth tergite and cerci pale yellowish brown, the latter long oval.

Larva.—Length 6 mm. Head distinctly broader than long. Antenna slender, tapering slightly and evenly, its length slightly less than one-half width of head; a very few fine spicules on apical half; hair tuft 2-branched, placed slightly before middle. Clypeal spines moderately stout, yellow, curved downward and slightly inward; anteantennal hair (A) with about 8 branches; lower head hair (B) single, about as long as antenna, placed about on line between hairs A; upper head hair (C) with 5–6 branches, placed almost directly behind B; no postclypeal hair (d); sutural hair (e) and transutural hair (f) both double. Thorax: Prothoracic submedian hairs in a longitudinal row, the anterior one short, double, the other two longer, single, the posterior one longest; a small multiple tuft posterior and laterad of these. Mesothoracic pleural hair and metathoracic pleural hairs each with a very short basal spine. Abdomen: First segment with 1 single and 1 double lateral hair; lateral hairs of segments 2–4 double. Comb scales of eighth segment in a large patch, the individual scales very small, yellowish, broadened apically, with an apical fringe; eighth segment with 2 siphonal tufts, one short and multiple, one longer and single; 2 large, multiple subsiphonal tufts; 2 anal tufts, 1 single, 1 triple. Siphonal index about 3, tapering very little; pecten of about 15 evenly spaced teeth on basal half, each with 1, or occasionally 2, fine lateral teeth; a large multiple tuft, with a swollen base, a short distance beyond the pecten. Dorsal saddle of anal segment small, indistinctly defined; dorsal hair group a long single hair and a shorter multiple tuft; gills 4, very short and stout, the ventral pair slightly longer than the dorsal pair; ventral brush well developed.

Holotype.— ♂ and paratype ♀, Suva, Fiji, 1944, collected by S. T. Helms. Types in U. S. National Museum (Cat. No. 56980).

The larval description is based on five specimens collected in crab holes at the type locality by S. T. Helms.

Aedes (Geoskusea) daggyi, new species

(Fig. 12)

Male.—Length 3–4 mm., wing 2.4–2.7 mm. Scales of head broad, appressed, dark brown, with lavender reflections, a few near eye margin yellowish; erect scales of vertex dark brown. Torus dark brown, without scales. Proboscis dark brown, about one-fourth longer than fore femur, the basal three-fifths compressed, the apical portion depressed. Palpus about one-sixth to one-seventh length of proboscis, slightly swollen apically. Thorax rather dark brown, somewhat paler along the pleural sutures and bordering the supra-alar area; pronotum without scales; scutum with dark brown, lanceolate scales; scutellum with rather broad, appressed, dark-brown scales. Several strong sternopleural bristles; no lower mesepimeral bristles; a few broad, yellowish scales on sternopleuron and upper mesepimeron. Wing scales all dark brown, mostly narrow; fork of vein 2 slightly distad of that of vein 4. Halter pale yellow, with knob dark brown. Legs: Coxae yellowish brown, the fore coxa with brownish scales anteriorly, the hind coxa with pale yellow-brown scales; rest

of legs with dark-brown scales except for yellowish scales on posterior surfaces of fore and mid femora ventrobasally and on anterior and posterior surface of hind femur on basal half or more; hind tibia on apical half posteriorly with semi-erect scales but with only a few scattered bristles; first hind tarsal segment with similar scales on basal fourth ventrally; outer claw of fore tarsus with a strong tooth; claws of mid and hind tarsi simple. Abdomen dark brown with basal yellow bands, broadened at sides and greatly narrowed or even broadly interrupted medially. Genitalia (fig. 12): Basistyles nearly 6 times as long as width at base, with a large ventrally directed lobe at apical third; portion of basistyle basad of this lobe strongly bowed outward, the portion beyond parallel with that of other side; lobe acuminate, about as long as dististyle, heavily clothed with fine yellowish hairs on the somewhat flattened median surface; basistyles with setae the entire length, finer and denser on inner surface of curved portion; dististyle about one-third length of basistyle, narrow, with an apical spine about half as long as dististyle; lobes of ninth tergite small, each with 2 or 3 setae; mesosome simple.

Female.—Only slightly larger than male; structure as in male except for the sexual differences in the antenna and abdomen, and the simple tarsal claws; proboscis slightly shorter in relation to fore femur. Color as in male.

Larva.—Length about 6 mm. Head slightly broader than long; antenna slender, tapering slightly and evenly, its length about one-half width of head; spicules sparse and fine; hair tuft 2–4 branched, placed slightly before middle. Clypeal spines very slender, nearly straight; anteantennal hair (A) with about 10 branches; lower head hair (B) single, longer than antenna, placed slightly posterior to hair A; upper head hair (C) nearly as long as hair B, 2–3 branched, located about width of antenna from hair B and at 45 degrees; the two C hairs about 3.5 times as far apart as C is from B; postclypeal hair (d) very small, about 3-branched, the branches again branched; sutural hair (e) simple; transutural hair (f) with 4 or 5 branches. Thorax: Prothoracic submedian hairs; inner long, double, median short, multiple, outer rather short. 2-branched, the median one most posterior, the outer one most anterior. Mesothoracic pleural hair group with a rather short basal spine; metathoracic pleural hair group with a very short basal spine. Abdomen: Lateral tuft of first segment with 1 triple and 1 single hair, of segments 2–4 double. Comb scales of eighth segment in a large patch, the individual scales very small, yellowish, broadened apically, with an apical fringe; eighth segment with 2 siphonal tufts, one short and double, one longer and single; 2 larger subsiphonal tufts, one with 4 hairs, one single; 1 anal tuft with 6 short hairs. Siphonal index about 2.4; pecten of about 16 evenly spaced teeth on basal half; each tooth with 1, or occasionally 2, lateral spines; tuft of 3 hairs, situated about length of pecten tooth from end of pecten. Dorsal saddle of anal segment not reaching middle of side; dorsal hair group a long single hair and a shorter tuft; gills 4, stout, about as long as saddle; ventral brush well developed.

Holotype.— ♂, Espiritu Santo, New Hebrides, July 24, 1943, R. H. Daggy. Paratypes: 15 ♀♀, 53 ♂♂, Espiritu Santo, New Hebrides, July, August, and October; 1 ♀, Te Ai River, Efate I., New Hebrides, October 27, 1943; 1 ♂, Yankee Creek,

Teneru Area, Guadalcanal, Solomon Is., December 21, 1943; 1 ♀, 3 ♂♂, Cervaga Creek, Guadalcanal, Solomon Is., June 26, 1943; 2 ♀♀, 2 ♂♂, Tillotsen Cove, Banika I., Russell Group, Solomon Is., August 21, 1943. Paratypes collected by R. H. Daggy and by Kenneth L. Knight. Type material deposited in U. S. National Museum (Cat. No. 56981), British Museum, University of Sydney, and University of Minnesota.

This species is closely related to *Aedes fimbripes* Edwards from New Britain but lacks the characteristic long hairs of the hind tibia of the male of that species. The genitalia also differ in having hairs on the basistyle basad of the lobe.

The larval description is based upon two lots of material from the New Hebrides. One of these lots was collected from ground water pools on Pellikula Peninsula, Espiritu Santo, November 1, 1943, by Dr. Knight, and the second from land crab holes on Ulilappa I., south of Espiritu Santo, July 25, 1943, by Dr. Daggy. The specimens from Ulilappa Island differ slightly from the others in having the lateral spines of the pecten teeth slightly shorter and more distad. All the adults were found in crab holes.

Aedes (Stegomyia) gurneyi, new species

(Fig. 14)

Male and female.—Head, thorax, and legs apparently colored exactly as in *Aedes* (*S.*) *albopictus* (Skuse), the pleural scales being in irregular patches rather than arranged in straight lines. Abdomen much as in *albopictus*, but the white bands on tergites III to VI, at least, are distinctly separated from the bases of the segments, with the anterior margin of each distinctly curved, rather than being entirely basal and straight anteriorly. Male genitalia (fig. 14): As in figure. The rather elongate basal lobe of the basistyle, with its straight setose surface, and the shape of the ninth tergite readily distinguish this from *albopictus* and related species.

Larva.—Length 6.5–7.0 mm. Head slightly broader than long; antenna about 6 times as long as width at base, scarcely tapering, its length about one-third width of head; no spicules; a single antennal hair about at middle. Clypeal spines small and slender, curved downward; anteantennal hair (A) double or triple; lower head hair (B) and upper head hair (C) both single, the latter about opposite hair A and almost directly behind hair B; postclypeal hair (d) of 20 fine hairs, or more, arising at the same level from a common stem; sutural hair (e) and transutural hair (f) both very fine, single. Thorax: Prothoracic submedian hairs 3, one double, one single, and one triple, the latter posterior and considerably the largest; mesothoracic and metathoracic pleural hair groups each with a very short basal spine. Abdomen: Lateral tuft of segment 1 of 4–5 hairs; of following segments variable, 1-3. Comb scales of eighth segment 5–8, the bases of most or all of them joined by a sclerotized area; each scale with a long slender apical tooth without a lateral fringe, but occasionally a few small lateral teeth at base; 2 siphonal tufts, one single, one triple; 2 subsiphonal

tufts, one single, one 4-haired; 1 anal tuft of 4 hairs. Siphonal index 2.6–3.0, its greatest width near middle; pecten of 6–7 rather irregular spaced teeth, reaching about to middle of siphon, each tooth with one or several small lateral teeth; hair tuft well beyond pecten, with 3 or 4 hairs. Dorsal saddle well sclerotized, not joined ventrally; saddle hair double or triple, arising from a non-sclerotized spot; dorsal hairs long, 1 single, 1 double; anal gills 4, stout, about as long as siphon; ventral brush of about 6 bars with relatively few hairs.

Holotype.— ♂, Bougainville, Solomon Islands, January 28, 1944 (reared from tree hole in jungle), A. B. Gurney collector. Paratypes: 28 ♀♀, 25 ♂♂, collected on Bougainville during January, February, and March, 1944, by A. B. Gurney and by C. R. Bruck. Type material deposited in U. S. National Museum (Cat. No. 56982), British Museum, and University of Sydney.

The larval description is based upon specimens reared from tree holes on Bougainville. The larva has also been collected from a swamp pond on Bougainville and from *Pandanus* leaf on Guadalcanal, Solomon Islands. It can readily be distinguished by the sclerotized area surrounding the bases of the comb scales.

Aedes (Stegomyia) marshallensis, new species

(Fig. 13)

Male.—Head apparently exactly as in *Aedes* (*S.*) *hebrideus* Edwards except that the white spots on the palpus, particularly the two basal ones, are usually considerably smaller. Thorax as in *hebrideus*, with the pleural scales arranged in two well-defined parallel stripes. Wings entirely dark scaled. Legs as in *hebrideus* except as follows: No white spot at tip of fore femur; white spot at base of fore tarsus 2 greatly reduced or absent; white tarsal bands of mid legs considerably reduced; bands of hind tarsus much narrower, each never more than one-fourth of length of segments 1–4 and not more than one-half of length of segment 5. Abdomen colored much as in *hebrideus*, the bands considerably behind anterior margins of segments, and broadly broken on tergite II, usually narrowly so on tergite III; spot on side of tergite II broad, not forming a narrow crescent. Genitalia (fig. 13): Resembling that of *hebrideus*, but differing markedly in the shape of the basal lobe, as shown in figure.

Female.—Coloration essentially as in male. White of palpus confined to a small spot at apex.

Larva.—Length 6.0–6.5 mm. Head slightly broader than long; antenna slender, scarcely tapering, its length about one-third width of head; no spicules; a single antennal hair at, or slightly beyond, middle. Clypeal spines very slender, curved downward; anteantennal hair (A) double; lower head hair (B) and upper head hair (C) both single, both anterior to hair A; hair C well behind hair B; postclypeal hair (d) a tuft of about 9 hairs arising at the same level from a common stem; sutural hair (e) and transutural hair (f) both very fine, single.

Thorax: Prothoracic submedian hairs 2 tufts of 3 hairs each, one directly anterior to and smaller than the other; mesothoracic and metathoracic pleural hair tufts each with a very short basal spine. Abdomen: Lateral tuft of first segment of 5–6 hairs; of second, 2–3; of segments 3–5 double; of 6 single; of 7 double. Comb scales of eighth segment 8–12, in a curved row, each with a single sharp apical spine or 2 or even 3 equal spines, and a lateral fringe of fine hairs on each side; eighth segment with 2 siphonal tufts, one of 4–5 hairs, one single; 2 subsiphonal tufts, one single, one of 5–6 hairs; 1 anal tuft of 5 hairs. Siphonal index 2.0–2.4; pecten of 7–8 evenly spaced teeth, each with 1 or 2 lateral spines; a tuft of 3 hairs at about middle of tube, beyond last pecten tooth. Dorsal saddle of anal segment reaching nearly to midline but never joined ventrally; saddle hair double; dorsal hairs long, 1 single, 1 double; gills 4, stout, usually twice length of saddle, sometimes considerably shorter; ventral brush of about 6 bars with relatively few hairs.

Holotype.— ♂, Airok Island, Ailinglaplap Atoll, Marshall Islands, June 6, 1944. Paratypes: 2 ♂♂, 12 ♀♀, same locality, June 4–6, 1944; 4 ♂♂, 6 ♀♀, Ebon Island, Ebon Atoll, Marshall Islands, June 11–13, 1944; 2 ♂♂, 8 ♀♀, Namarik, Namarik Atoll, Marshall Islands, June 17, 1944; 1 ♂, 6 ♀♀, Kili Island, Marshall Islands, June 8, 1944. All collected by D. A. Treat. Type material deposited in U. S. National Museum (Cat. No. 56983), British Museum, and University of Sydney.

The larval description is based upon specimens from Namarik, but larvae were collected at all of the four localities at which adults were taken. Probably the best characters to distinguish the larva from that of *hebrideus* are the frequent occurrence of 2-spined, or even 3-spined, comb scales, the spines of approximately equal length, and the incomplete sclerotization of the anal segment.

A REVIEW OF THE TYPE MATERIAL OF CULEX FIDELIS DYAR

Culex fidelis Dyar was synonymized by Edwards (1929) with *Culex brevipalpis* (Giles). An examination of the four cotype males of *fidelis* in the U. S. National Museum shows that this synonymy is correct for three of the cotypes, but the fourth cotype proves to be a new species belonging to the subgenus *Lophoceraomyia.*

We have used the original spelling for this subgenus rather than *Lophoceratomyia* as used by Edwards and other authors. As Neave (1939: 996) has indicated, the name *Lophoceraomyia* Theobald has priority over *Lophoceratomyia* Theobald. *Lophoceraomyia* Theobald is a monobasic genus with *uniformis* Theobald as type. The type of *Lophoceratomyia* is given by Edwards as *fraudatrix* Theobald.

Culex (Lophoceraomyia) lavatae, new species
(Fig. 1)

Culex fidelis Dyar, 1920: 180 (in part).

Male.—Length 3.0 mm., wing 2.2 mm. Vertex with hairlike, yellowish, and narrow, curved, white scales intermixed with many upright, forked, brownish scales, a patch of broad, appressed, white scales at extreme side of vertex. Torus unscaled, with a strong, toothlike prominence at inner dorsal angle; flagellum without specialized setae on VI (torus counted as segment I), 4 slender setae on VII, a short tuft of 6 setae and 2 longer setae on VIII, a long tuft of 4 setae on IX. Proboscis dark, about one-fifth longer than front femur, some stiff bristles beneath at base. Palpus longer than proboscis by half length of last segment, barely swollen at apex, dark, with very few bristles. Scutum with narrow, curved, uniformly golden-brown scales, a few similar scales on pronotum. Scutellum with very narrow scales, which are somewhat paler scales than those on scutum. Pleuron without visible scales. Wings dark scaled. Halter ochreous with a few dark scales on knob. Legs brown, femora paler beneath. Abdomen brown, unbanded, paler beneath and with many long fine hairs. Genitalia (fig. 1): Basistyle with an inner row of 6 bristles; subapical lobe bearing a rod, 2 slightly longer bent-tipped setae, 4 stout bristles, and a slender leaflet; dististyle somewhat curved, evenly tapering, with a small apical tooth; mesosome with lateral process spiny tipped and toothed along outer side, median process bladelike.

Holotype.— ♂, Los Baños, Philippine Islands, July 28, 1915. U. S. National Museum (Cat. No. 56984).

The holotype specimen is one of the four cotypes of *Culex* (*Neoculex*) *fidelis* Dyar, the other 3 being specimens of *brevipalpis* (Giles). Dyar's description of the male palpi and genitalia indicates that *fidelis* should be given as a synonym of *brevipalpis*. Of the two females tentatively associated with the males of *fidelis* by Dyar, one is *C.* (*Culex*) *fuscocephalus* Theobald and the other is a *Lophoceraomyia* possibly referable to *lavatae*.

Culex lavatae belongs in the *mammilifer* group of *Lophoceraomyia* by virtue of the inner dorsal projection on the male torus. The relatively simple male antenna indicates a relationship to *minor* Leicester and *minutissimus* (Theobald), but the presence of setae on segments VII to IX in *lavatae* is distinctive. The mesosome differs from any previously described.

Culex (Neoculex) brevipalpis (Giles)

Stegomyia brevipalpis Giles, 1902: 384.
Culex fidelis Dyar, 1920: 180 (in part).

The cotype specimen on which Dyar based his original description of the male genitalia is here designated as the lectotype of *fidelis* Dyar.

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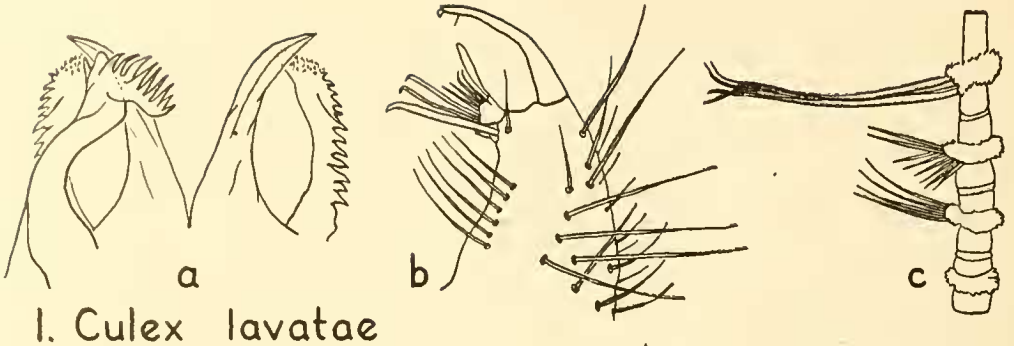

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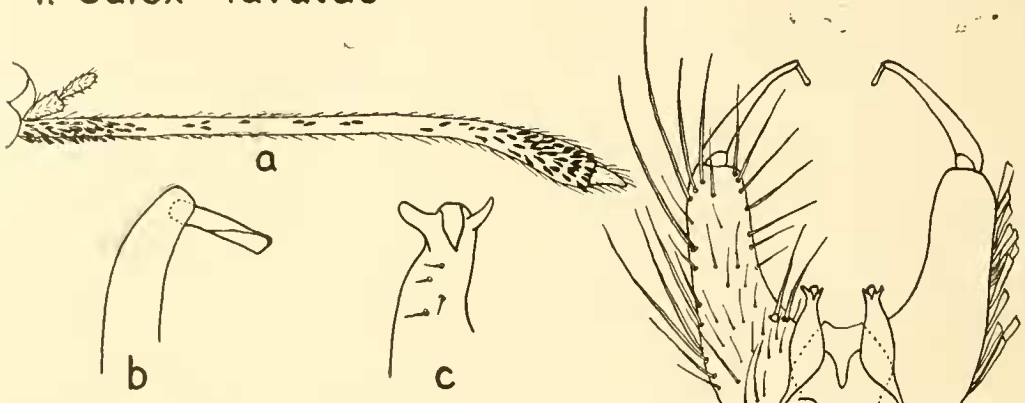
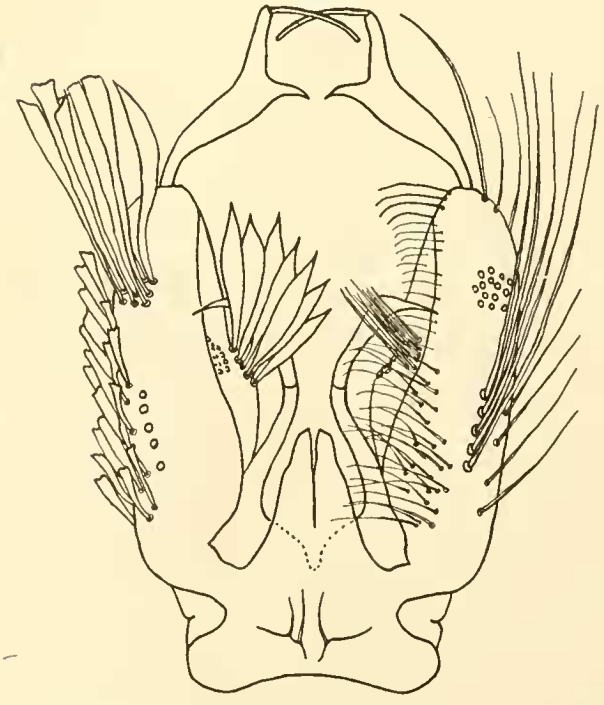
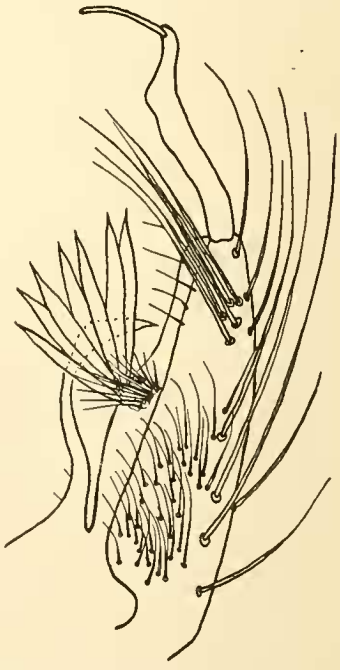


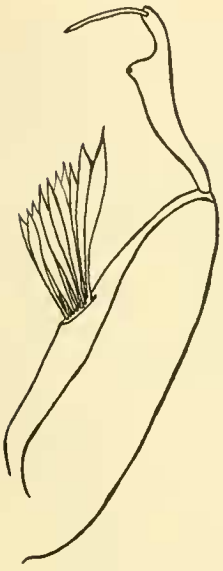
2. Aedes clavirostris



3. Aedes aranetanus

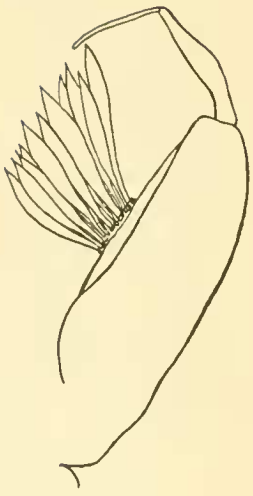


4. Aedes flavipennis



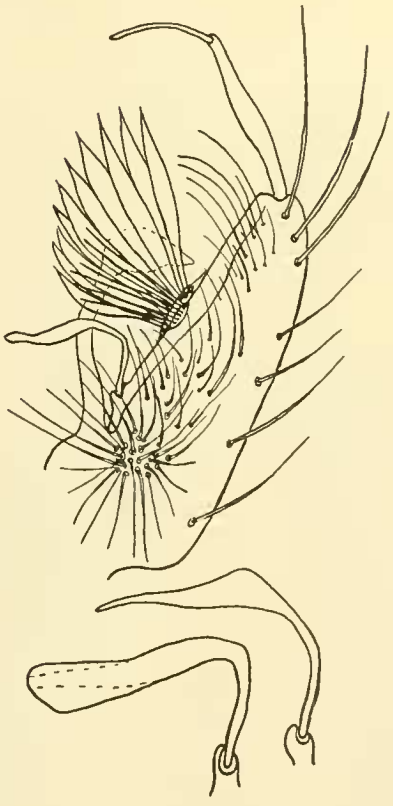
5. avistyla

6. poicilia

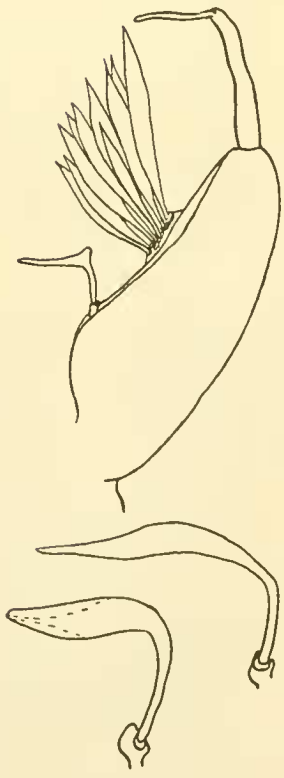


7. knighti

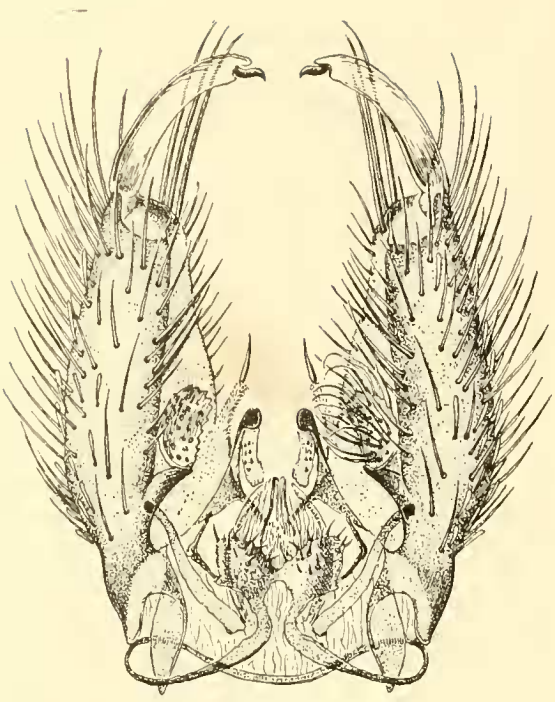
8. samoanus



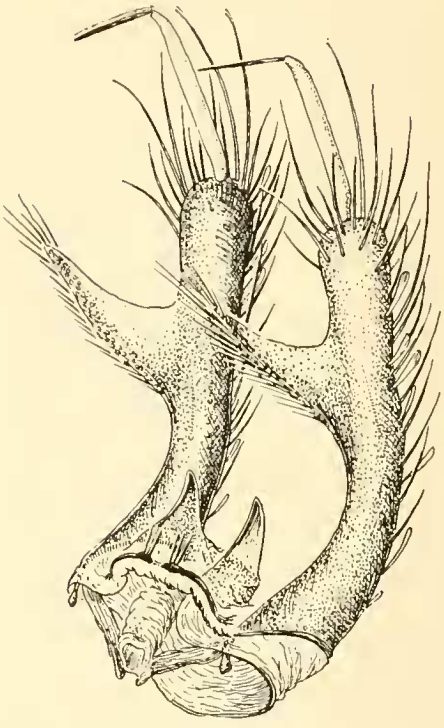
9. solomonis



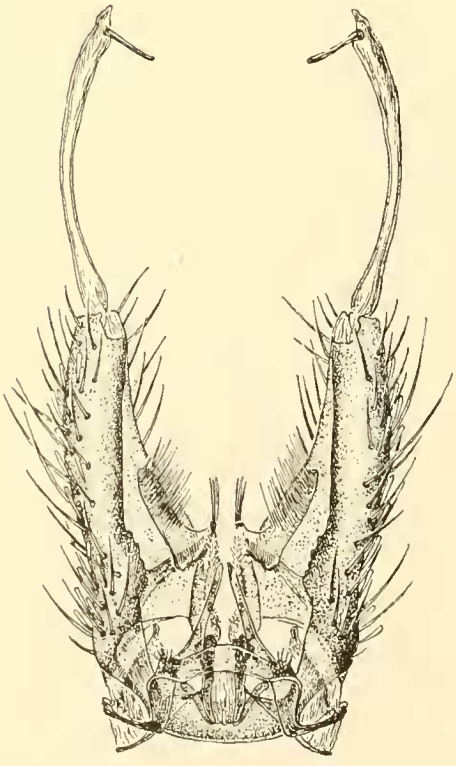
10. kochi



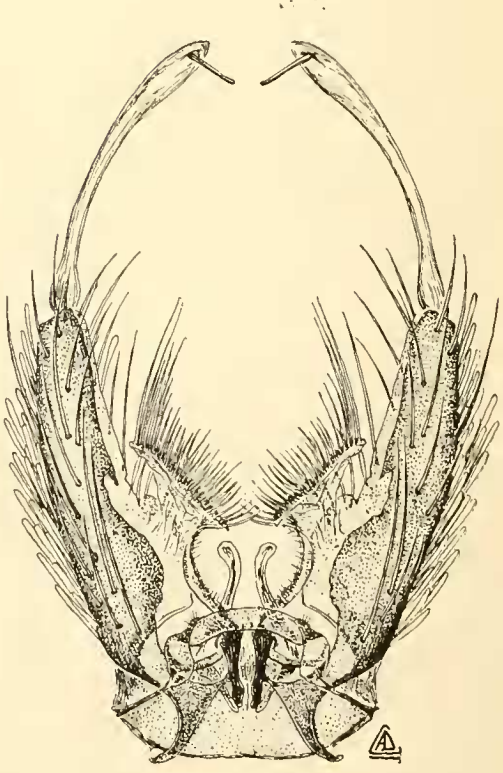
11. suvae



12. daggyi



13. marshallensis



14. gurneyi

Explanation of Figures

1. *Culex lavatae*, n. sp., male; *a*, ventral view of mesosome, tenth sternite included on left; *b*, basistyle and dististyle; *c*, antennal segments 6 to 9 (torus counted as 1). 2. *Aedes clavirostris*, n. sp.; *a*, palpus and proboscis of female; *b*, tip of dististyle enlarged; *c*, tip of tenth sternite enlarged; *d*, male genitalia, ventral, bristles shown at left, scales at right. 3. *Aedes aranetanus* (Banks), male genitalia, ventral, scales on left, bristles on right. 4. *Aedes flavipennis* (Giles), dististyle, basistyle, and claspette of male.

5. *Aedes avistyla* Brug, outline of basistyle and dististyle (redrawn from Brug, 1939). 6. *Aedes poicilia* (Theobald), outline of basistyle and dististyle. 7. *Aedes knighti*, n. sp., outline of basistyle and dististyle. 8. *Aedes samoanus* (Gruenberg), outline of basistyle, dististyle, and two enlarged views of specialized seta. 9. *Aedes solomonis*, n. sp., same view as preceding but with bristles shown. 10. *Aedes kochi* (Doenitz), same view as preceding but bristles omitted.

11. *Aedes suvae*, n. sp., male genitalia, ventral. 12. *Aedes daggyi*, n. sp., male genitalia, oblique ventral view. 13. *Aedes marshallensis*, n. sp., male genitalia, ventral. 14. *Aedes gurneyi*, n. sp., male genitalia, ventral.

THE GENUS LACHNOMYRMEX, WITH THE DESCRIPTION OF A SECOND SPECIES (Hymenoptera: Formicidae)

By Marion R. Smith, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture*

Since 1910 the genus *Lachnomyrmex* has been known from the single species *scrobiculatus* Wheeler, of Guatemala. This article describes a second species from Barro Colorado Island, Canal Zone. In reviewing the generic and specific descriptions, the author has found a number of mistakes which should be corrected, especially since these errors unfortunately have already been repeated in literature, by both Wheeler and Emery.

LACHNOMYRMEX Wheeler

Lachnomyrmex Wheeler, 1910, Amer. Mus. Nat. Hist. Bul. 28: 263; Emery, 1922, Genera Insect. Fasc. 174 C: 245, 269; Wheeler, 1922, Amer. Mus. Nat. Hist. Bul. 45: 670. Genotype, *Lachnomyrmex scrobiculatus* Wheeler Monobasic.

Corrections and additions to the detailed generic description given by Wheeler: Antenna of worker and female 11-segmented, not 12-segmented as stated. Anterior border of clypeus not rounded and entire as described but with a median incision and a slight emargination on each side of the incision. Eye of worker with approximately 5–7 facets in its greatest diameter, ending anteroventrally in a distinct angle. Mandible of worker with 4 or 5 teeth, 2 near the apex of the masticatory border, 1 near the middle, and 1 or 2 near the base.

The following key will distinguish the workers of the two species: